MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology / Life Sciences)

20 OCTOBER 2016
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer all **FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Instruction: Answer all **FIVE** questions.

Question 1 [10 marks]

Given $z = 11 + 4i$ and $w = 5 - 2i$.

a. Find the standard form of $\frac{z}{w}$. (3 marks)

b. Find the polar form of z and w. (5 marks)

c. Find the polar form of z^5. (2 marks)

Question 2 [10 marks]

Given the equation of the ellipse $49x^2 + 25y^2 - 392x + 200y - 41 = 0$.

a. Find the center, foci and vertices of the ellipse. (7 marks)

b. Sketch the ellipse. (3 marks)

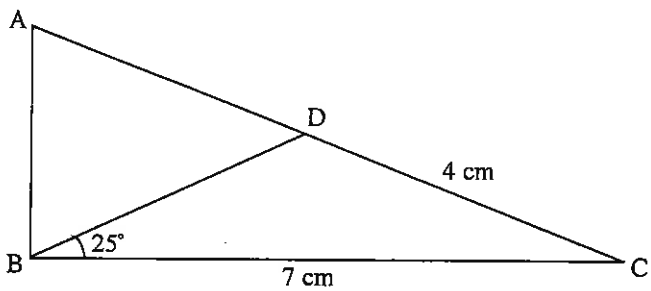
Question 3 [10 marks]

a. Establish the identity: $\frac{\sec\theta - \cos\theta}{\sec\theta + \cos\theta} = \frac{\sin^2\theta}{1 + \cos^2\theta}$ (2 marks)

b. Solve the equation: $3\cos^2 2\theta - 4\cos 2\theta + 1 = 0, \quad 0^\circ \le \theta < 360^\circ$ (8 marks)

Question 4 [10 marks]

ABC is a right triangle with BC = 7 cm and $\angle ABC = 90^\circ$. D is a point on AC such that CD = 4 cm and $\angle CBD = 25^\circ$.



a. Find the obtuse angle $\angle BDC$ and the length BD. (6 marks)

b. Find the length AB and the area of the triangle ABC. (4 marks)

Continued...

Question 5 [10 marks]

a. Given $P = \begin{bmatrix} 4 & -2 \\ 5 & 12 \end{bmatrix}$ and $Q = \begin{bmatrix} -6 & 0 & 11 \\ 3 & 1 & -4 \end{bmatrix}$.

Find the matrices P^2 and PQ. (3 marks)

b. Solve the following system of linear equations by using the inverse matrix method.

$$\begin{aligned} x + 2y - 4z &= -5 \\ 3y + 4z &= -3 \\ 2x - y + 2z &= 20 \end{aligned}$$

(7 marks)

End of Page

APPENDIX

Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$$
$$\cos A\cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$$
$$\sin A\sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

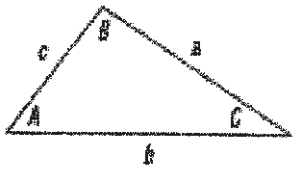
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Area of a Triangle: $A = \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{where} \quad s = \frac{1}{2}(a+b+c)$$

Polar Coordinates

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$r = \sqrt{x^2 + y^2}$$
$$\tan\theta = \frac{y}{x}$$